GEOLOGICAL SURVEY OF CANADA
G. M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR.

DESCRIPTIVE NOTE

ON THE

SYDNEY COAL FIELD

CAPE BRETON, NOVA SCOTIA

TO ACCOMPANY A REVISED EDITION OF THE GEOLOGICAL MAP OF THE COAL FIELD

Being Sheets 133, 134, 135 N.S.,

Summarized from the Reports of the Geological Survey of Canada, with the addition of later observations,

BY HUGH FLETCHER, B.A.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
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The district covered by the three map-sheets numbered 133, 134 and 135, comprises part of the counties of Cape Breton and Victoria in the province of Nova Scotia, embracing the whole known area of the productive measures of the Sydney coal-field, together with a large area of the underlying rocks. The sheets above enumerated take the place of the maps of the Sydney coal-field previously issued with the Reports of Progress for 1874-75 and 1875-76. The part relating to the Coal Measures has been largely taken from surveys made by Professor J. P. Lesley, in 1862 and 1863, by Mr. B. S. Lyman in 1865, by Mr. Richard Brown, prior to 1873, by the Dominion Coal Company in 1895, from surveys made for the Geological Survey by Mr. Charles Robb and Mr. Hugh Fletcher, and from other sources, as stated in the Geological Survey Reports. The coast-lines are generally from the admiralty charts.

In this district, west of Sydney River, the contour of the ground occupied by rocks older than the Coal Measures is unusually diversified, and its connection with the geological structure is so plain that it cannot be overlooked. Four parallel ridges, the Coxheath, Boisdale, Boularderie and St. Ann hills, divided from one another by deep valleys and indentations of the sea, run from south-west to north-east and give much variety to the scenery. The height above the sea of the Coxheath and Boularderie ranges seldom exceeds 550 feet, while the Boisdale Hills have in places an elevation of 890 feet, and the St. Ann Hills of 1045 feet. The central axes of the two latter, as well as that of the Coxheath Hills, consists of syenitic and felspathic rocks, flanked by Cambrian and Carboniferous strata. The latter are found in the valleys, but the denudation to which they have been subjected has been so great that they now lie only in small patches on the hills. Brooks are numerous, and their general direction corresponds with that of the hills and longer estuaries. Those that flow northward are the largest, but none are navigable for any great distance from the sea. Those flowing east and west, are short moun-

tain torrents, which cut deeply into the syenitic rocks, rendering the land rugged and unfit for cultivation. Picturesque glens and gorges are formed in both cases by the erosion of the friable Carboniferous conglomerate. The distribution of the various geological formations accords with the direction of the watersheds, which are themselves the axes of folds continuous with those affecting the Coal Measures. That of the Coxheath Hills is the anticline which runs through Point Edward and thence to South Bar and Bridgeport Basin. Instead, however, of dipping regularly from it on the south-east side, the Carboniferous rocks are broken and tilted by the Sydney River fault, which brings the Millstone Grit near the Forks close to the felspathic rocks. On the opposite slope the dip is towards the valley of Leitch Brook, which flows in a basin of Carboniferous Limestone and Millstone Grit rocks, the rim of which is the Boisdale Hills, an extension of the anticline that runs from Point Aconi to Saunders Cove. Boularderie Island forms another basin, the upper portion of which, composed chiefly of Millstone Grit and Coal Measures, is alone exposed; and the last lies to the westward of the St. Ann Hills

These undulations are not always simple, but are accompanied by great lines of fracture and dislocation. Two of these run along the south-eastern slopes of the Coxheath and St. Ann hills, and a third probably occupies a similar position on the Boisdale Hills, cutting out a great thickness of Lower Carboniferous strata.

The succession of the formations which occur within the district is as follows, in ascending order :—

1. Syenitic, gneissoid and other felspathic rocks	Pre-Cambrian.
2. George River Limestone Series	
3. Barachois slates and other rocks	Cambrian.
4. Carboniferous Conglomerate Series	Carboniferous.
5. Carboniferous Limestone Series	
6. Millstone Grit	
7. Coal Measures	

1. Syenitic, Gneissoid and Felspathic Rocks.

These rocks are exposed on anticlines in the Coxheath, Boisdale and St. Ann hills. In the Coxheath Hills they consist of felsites and quartz-felsites, compact, fragmental and granular, often porphyritic, of various bright colours, associated with hornblendic and micaceous granitoid rocks and including a light-coloured altered felsite useful as a fire-clay. Traces of hæmatite are frequent among these rocks, while on one of the deposits of copper ore is the Coxheath mine. Separated from the Coxheath Hills by a valley less than three miles wide in the narrowest part, lie the Boisdale Hills, running parallel with St.

Andrew Channel, and bringing up in its axis rocks generally containing quartz, hornblende and sometimes mica in addition to felspar.

In the Cape Dauphin district, red syenite and granite are intimately associated and alternate with fine-grained gneisses and felsites.

2. George River Limestone Series.*

On the south-eastern slopes of the Boisdale and St. Ann hills, there runs a narrow zone of rocks, seldom exceeding half a mile in width, consisting of highly crystalline limestone and dolomite, containing serpentine, talc, asbestus, mica, tremolite, graphite, galena, hæmatite, magnetite and other minerals; associated with felsite, syenite, diorite, mica-schist, quartzite and quartzose conglomerate, of various colours, but chiefly bluish, assigned by Mr. Hartley to the Laurentian. This formation includes the marble of George River, of Marble Mountain and Eskasoni and the great bed of white dolomite quarried at New Campbellton, an analysis of which is quoted on page 15.

3. Barachois Slates and other Rocks—Cambrian.*

The rocks in Cape Breton described as Lower Silurian in the earlier Reports, comprise beds, referable, on the evidence of their fossils as determined by Dr. G. F. Matthew, to horizons from that of the Etcheminian to that of the Lingula Flags. In the area to which these maps refer, they are chiefly of the age of the Lingula Flags series. On St. Andrew Channel they comprise reddish, greenish, purple, bluish and gray slate, argillite, quartzite, sandstone, conglomerate and limestone; while black, bluish and gray graphitic slaty argillite, containing *Dictyonema sociale* and other fossils extends up along McLeod Brook.

4. The Carboniferous Conglomerate Series.*

By Mr. Richard Brown, this formation was separated from the Carboniferous and correlated with the Devonian or Old Red Sandstone of England. It generally flanks the metamorphic hills which form the axes of the anticlines and from which its pebbles have obviously been derived. Its thickness is variable. On Watson Brook it seems to

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* Reports of Progress, Geol. Surv. Can., 1870-71, pp. 4-5; 1873-74, pp. 174, 252 to 262; 1875-76, pp. 381 to 388; 1876-77 p. 426.

* Reports of Progress, Geol. Surv. Can., 1875-76, pp. 388 to 393; 1876-77, pp. 428 to 437.

have a thickness of about 2525 feet, while on St. Andrew Channel the Carboniferous Limestone lies directly upon Cambrian slates and sandstones.

This formation presents the aspect of a friable indian-red or brick-red, rarely green, conglomerate and sandstone, the constituents of which range from blocks three feet in diameter downward and exhibit great differences in composition according to the locality in which they are found. The most common matrix is itself a fine conglomerate or coarse grit, possessing very little coherency; not unfrequently, however, it consists of calcspar, and more rarely of hæmatite and quartzite or chert. The coarser beds greatly predominate, but alternate constantly with lenticular or persistent bands of reddish, coarse- and fine-grained, jointed, friable sandstone, sometimes mottled with green and traversed by streaks of white calcspar, or with red and green marl, including an occasional layer of impure limestone. In general, but not invariably, the conglomerate is finer at the top than towards the base of the formation. A few obscure fucoids were the only fossils discovered, although many of the finer beds seem to be well adapted for their preservation.

5. The Carboniferous Limestone Series.

The general characters of these rocks are given in the Reports for 1873, 1874 and 1875, with detailed sections of them on many of the streams. They consist of thick beds of red and gray argillaceous shale, sometimes calcareous, approaching in character to marls, and frequently without any trace of lamination or bedding; these beds often being copiously charged with nodules of limestone and argillaceous iron ore. With them are associated numerous beds of limestone, concretionary, laminated and compact, and generally dark-gray or almost black, and fetid; sometimes gypsiferous and containing traces of galena and copper-pyrites, and occasionally holding marine fossils of the ordinary Lower Carboniferous forms. Beds of gypsum, and of red and gray micaceous sandstone, generally slightly calcareous and often beautifully ripple-marked, are also of frequent occurrence in this formation, chiefly towards its summit, where also has been noted one bed of bituminous and highly calcareous shale between three and four feet in thickness. This contains *Sigillaria*, *Lepidodendron*, and the scales, teeth, spines and coprolites of fishes, with

*Reports of Progress, Geol. Surv. Can., 1872-73, p. 239; 1873-74, p. 173; 1874-75, p. 169; 1875-76, p. 394; 1876-77, p. 437.

Naiadites. It has a *Stigmaria* under-clay. The point on which the town of Sydney stands is composed of the red sandstones, marls and thin bedded limestones of the upper part of this formation.

6. The Millstone Grit.

The rocks overlying the Carboniferous Limestone series, intermediate between these and the productive Coal Measures, and thus occupying a position analogous to that of the Millstone Grit of the English coal fields, are well exposed in the natural sections afforded by Sydney Harbour, the Great Bras d'Or and other parts of the coast. They consist, on Sydney Harbour, of a great series of sandstone beds, generally very coarse and almost conglomerate in character, and deeply stained with peroxide of iron; but sometimes of a bluish-gray colour, finely grained, evenly bedded and flaggy, with occasional patches (but apparently no continuous beds) of argillaceous shale and coal. Some of the sandstone beds, contain great quantities of obscure and fragmentary vegetable fossils, such as *Sigillaria*, *Stigmaria*, *Lepidodendron*, *Cordaites* and *Calamites*. The shales also contain plant remains. In one bed or thin patch of carbonaceous shale were observed teeth, scales, spines and coprolites of fishes. The Millstone Grit formation is here distinguished from those underlying and overlying it by the absence of calcareous strata; false bedding is prevalent, and it is difficult to arrive at any just or accurate estimate of its total thickness.

In the eastern section of the field, however, where the same formation is very extensively developed, it is much thicker; and while still preserving the same character and the same relations to the overlying and underlying rocks, includes thicker and more regular beds of argillaceous shale, with seams of coal, one of which at least is of workable dimensions and quality. In this respect the remarkably perfect section afforded by the cliffs at the western side of Mira Bay* is more closely allied than in the western district to the typical series of rocks of this division in the Joggins section, as described by Sir William Logan, from which, however, it differs in the general absence of calcareous beds. There can be no doubt that the materials of which the Millstone Grit rocks are composed have been derived chiefly from the disintegration of the underlying rocks, which may have been either the Lower Carboniferous sandstones, shales and conglomerates, or the older crystalline rocks from which these have in their turn been derived. This fact is very strikingly manifested on the shores of the Great Bras d'Or, where some beds of the Millstone Grit are found to be largely

* Report of Progress, Geol. Surv. Can., 1874–1875, p. 176.

composed of angular fragments from the syenite of St. Ann Hills in the immediate vicinity; while at other places, more remote from such crystalline masses, the ingredients consist entirely of the comminuted fragments of rocks of the Lower Carboniferous.

7. The Coal Measures.*

The line of demarcation between the Millstone Grit and the so-called productive measures is a somewhat arbitrary one; and, from some points of view, the distinction may be regarded more as a matter of convenience for the purpose of description than as one of geological importance. The southern limit of the productive measures is very frequently indicated by the occurrence of great angular blocks of coarse sandstone profusely scattered over the surface, and derived from the sandstone beds of the Millstone Grit. The whole series corresponds very closely, both in geological position and in composition, with Division No. 4 of Sir William Logan's Joggins section, the upper part of the section in the Sydney coal-field being, however, cut off by the sea.

The land area occupied by the productive Coal Measures in the eastern or Sydney coal-field, may be estimated at 200 square miles, being about 32 miles in length from north-west to south-east by about six miles in width. It is limited on three sides by the Atlantic Ocean; and towards the south-west by the outcrop of the subjacent Lower Carboniferous rocks. This area forms the southern extremity of an extensive trough or basin, which is for the most part hidden under the waters of the ocean, and which has been corrugated by numerous subordinate folds, bringing the same coal-seams repeatedly to the surface along the north-east coast of the island, under the most favourable conditions and circumstances for their extraction and shipment.

The whole coast is deeply indented by bays and channels approximately coinciding with the axes of these folds, and affording in the sea-cliffs numerous natural sections of the strata and exposures of the coal-seams. Some of these bays also constitute excellent harbours, one of which—Sydney Harbour—situated towards the centre of the district, ranks among the finest and most commodious on the Atlantic coast of North America. The cliffs are generally from thirty to eighty feet high, standing perpendicularly, or frequently overhanging the sea. The country inland is of a gently rolling character, the maximum height being about 250 feet.

Reports of Progress, Geol. Surv. Can., 1872-73, p. 239; 1873-74. p. 177; 1874-75, p. 195, also Summary Reports for 1895, 1896 and 1897.

Such natural advantages, combined with its highly favourable geographical position, point to this district as probably the most important in the Dominion for the supply of fuel to steamships navigating the Atlantic. During the few months of winter, when the more northerly harbours are closed or obstructed by ice, an outlet is afforded by the railway connecting many of the collieries with Louisburg, a fine harbour, open and safe for shipping at almost any season.

The aggregate thickness of coal in workable seams, outcropping on the shore, and for the most part exposed in the bays and cliffs, is from forty to fifty feet; the seams vary from three to nine feet in thickness. They generally dip at a very low angle, and appear to be very little affected by faults or disturbances. As the strata all dip seaward, much of the coal will be available in the submarine as well as in the land areas. From experience at the Sydney mines it has been fully established that, with due caution and care, these submarine areas may be worked to a large extent.

The coal is of the bituminous or 'soft' variety, with comparatively little diversity in the quality of the different seams; all of which yield a fuel exceedingly well adapted for general purposes, while that of some of them is specially applicable to the manufacture of gas. As compared with the Pictou coal, it is characterized on the whole, by a greater proportion of combustible matter and a smaller proportion of ash; but on the other hand it usually contains a greater amount of sulphur.

The rocks of this district are affected by three anticlinal and four synclinal folds, approximately parallel to one another, the latter named respectively the Cow Bay, Glace Bay, Sydney Harbour and Bras d'Or basins. The several folds are, as already stated, marked by the occurrence of bays and channels running in a direction nearly parallel to their axes. The subdivisions are thus geographically, as well as geologically, well marked.

The strata associated with the coal-seams may be described under the following heads:—(1.) Argillaceous shale; (2.) Arenaceous shale; (3.) Red and green marl; (4.) Sandstone; (5.) Under-clay; (6.) Limestone; (7.) Black shale; (8.) Coal. Detailed sections of the alternations of these beds in the various basins are given in the Report for 1874–75.

1. *Argillaceous Shales.*—These strata, together with the arenaceous shales (2) into which they pass by insensible gradations, and red and

green marls (3), from which they differ chiefly in colour and in the general absence of lamination in the marls, constitute upwards of one half of the total thickness of the measures. They no doubt originally consisted of fine mud, with more or less sand intermixed, and are of a gray or bluish-gray colour. Some of the beds contain much iron-pyrites; and nearly all are charged with argillaceous ironstone, sometimes in thin, regular layers, but generally in spherical or ellipsoidal nodules or concretions. They generally contain a great variety of fossil plants, chiefly ferns; the most delicate and fragile fronds and stems of these being often beautifully preserved.

Many trunks of erect and prostrate *Sigillariæ*, in some cases with their *Stigmaria* roots attached and penetrating the coal seams, are found in the shales; and these appear to be confined to no particular horizons. The largest observed trunk was nearly five feet in diameter; but the usual size, is from two to three feet, the bark being converted into coaly matter. Some of the beds are very copiously charged with a small bivalve shell of the genus *Naiadites* associated with plant remains. The argillaceous shales are not always persistent, but often become arenaceous and sometimes pass into sandstone. Occasionally the change is so sudden as to give to the beds the appearance of being faulted.

3. *Red and Green Marls.*—Although not in all cases strictly correct, this term is convenient as designating a set of strata having a tendency to disintegrate into clay or mud on exposure to the air. Beds of this nature, of considerable thickness, are distributed throughout all parts of the Carboniferous series, but they contain few fossils.

4. *Sandstones.*—The sandstone beds constitute the most prominent, thickest and most persistent members of this series of strata. They are very numerous and are distributed throughout all parts of the formation, generally overlying every coal seam, with an interval of a few feet of argillaceous shale, but sometimes actually forming the roof of the seam. In colour they are gray, yellowish and greenish, usually coarse and pebbly, especially towards their base, where, for a limited thickness, they sometimes assume the character of conglomerates. False-bedding is very prevalent in the thicker and coarser grained strata, which are usually of considerable thickness, up to forty or fifty feet. Such beds are generally charged with casts of plants, *Calamites*, *Cordaites*, *Lepidodendron* and *Sigillaria*—and with much carbonized vegetable matter. Some of the thinner layers are highly calcareous.

5. *Under-clays.*—The roots and innumerable rootlets of *Stigmaria ficoides* constitute the most distinctive feature of these beds, which are,

for the most part, highly argillaceous or siliceous, often constituting good fire-clays. They are generally full of ironstone nodules and merge by insensible gradations into the beds upon which they rest. These under-clays occur immediately below every coal-seam and bed containing carbonaceous matter.

6. *Limestone.*—In the lower part of the Coal Measures, beds of black bituminous limestone, of which there are about sixteen, varying in thickness from half an inch to two feet, afford valuable evidence in the identification of the several coal-seams at distant intervals. They abound in remains of shells and ganoid fishes and in some instances show a well marked cone-in-cone structure, the cones being at least an inch in diameter.

7. *Carbonaceous Shales.*—Beds of this nature may be regarded as impure coals, intermixed with numerous thin layers of shale. Many of these workable coal-seams inclose layers of such shale, and also sometimes pyritous bands. Such beds are sometimes of the nature of cannel, being compact, with conchoidal fracture, containing more or less calcareous matter and passing into bituminous limestone, charged with the fossil forms peculiar to the limestones. More frequently, however, the carbonaceous shales are soft and laminated, entirely made up of the matted leaves of *Cordaites*, converted into mineral charcoal. There are two highly characteristic and very persistent beds of calcareous bituminous shale, overlying two adjacent coal seams, which serve as a most valuable guide in tracing the structure of the whole field. These beds appear to be composed entirely of *Naiadites*, distributed uniformly and packed closely in layers in the planes of the bedding, giving the shales, when broken, a corrugated appearance.

8. *Coal.*—In taking a general view of the mode of occurrence of the coal-seams in this field, it appears that, although local variations are neither few nor small, their similarity of conditions and persistency over great areas is very remarkable. The disturbances which the strata have undergone are not of such a nature or amount as to occasion any great uncertainty in regard to the equivalency of the various seams at different points. In a few instances the coal-seams are split by the gradual thickening of their clay partings. In some cases, seams which are of workable thickness and good quality at one place become from similar causes unworkable at no great distance. In other instances the continuity of the seam is interrupted at intervals by masses of rock similar to that overlying the coal.

Taking the average of all the sections measured, the total number of seams in the productive measures is twenty-four, of which six are

three feet or upwards in thickness, and the total average thickness of coal may be stated at forty-six feet.

Subordinate Basins in the Coal Field.

These have already been enumerated and their structure will be readily understood by reference to the maps. A few notes may, however, be useful.

The Cow Bay Basin.—On the north side of this basin the strata dip at a low angle. On the south side the angle of inclination is 35° to 42°. The entire series of strata (which does not, however, include the upper portion of the productive measures developed in other parts of the field) is exposed within a distance of three miles and a half measured along the north side of the bay. The average breadth of the basin at the shore, between the outcrops of the lowest seam, does not exceed two miles and one-third, and it terminates at a point less than nine miles from the shore. Two seams, the Blockhouse and the McAulay, have been worked in this basin, but at present, the land area being under the control of the Dominion Coal Company, no coal is being extracted, although a shaft is being sunk by the Newcastle Syndicate to win the coal in the submarine area on the McAulay seam and test the lower seams. The large seam of the Neville pits, near the western end of the basin, correlated with the McAulay seam on the map, is by others supposed to be the McRury, and further explorations are perhaps necessary to put this point beyond dispute. The Tracy seam in the Millstone Grit, has been worked to a small extent in this basin on the shore of Mira Bay, and has been opened but not worked at several points to the westward.

The Glace Bay Basin.—The anticlinal axis separating the Cow Bay and Glace Bay basins, skirts the shore at Cape Percy. The latter presents a striking contrast to that of Cow Bay, being wide, with uniformly gentle dips on both sides; and embraces, in addition to the beds exposed in that of Cow Bay, 610 feet of strata overlying the highest of these, and including the Hub seam, the highest workable coal-seam in the series in this district. Four other seams have also been worked in this basin; but the operations of the Dominion Coal Company are at present confined principally to the Phelan seam. The attitude of all the seams in the Glace Bay basin (extending for a length of about twenty miles), as ascertained by careful measurement and recorded on the map, is a striking proof of the general regularity of deposit and the absence of faults which characterizes this district.

The Sydney Harbour Basin.—In the further extension of the Coal Measures westward, the next basin which comes under notice includes the Lingan, Low Point and Sydney mines districts, and extends from Indian Bay and Bridgeport Basin as far as Point Aconi, embracing all the coal seams in the field. An anticlinal axis, that skirts the north shore of Bridgeport Basin and runs thence westerly to the vicinity of South Bar on Sydney Harbour, divides this basin from that of Glace Bay. On the north side of this axis the rocks dip at angles varying from 12° to 16° at Lingan, increasing to 40° at the Victoria mines. The sea-coast follows the fold of the strata in such a manner as to bring the entire volume of the Coal Measures upon the cliffs in several fine sections. From Low Point lighthouse to Lingan the strike of the rocks is nearly parallel to the shore. The only colliery at present worked in this basin is the Sydney mines.

The Bras d'Or Basin.—A little to the west of the Little Bras d'Or, a low, broad anticline, running from Point Aconi to Saunders Cove, deflects the strata to the south to form the Bras d'Or basin, which includes on opposite sides the Boularderie and Cape Dauphin districts. No collieries are at present worked in the former. In the Cape Dauphin district the Messrs. Burchell are shipping coal from the New Campbellton mine, from a seam assumed to be the Blackrock or Number Three seam of the Sydney mines section and the Phelan seam of Glace Bay. On approaching the mountain, the Carboniferous rocks are abruptly cut off and thrown into an attitude for the most part vertical and occasionally overturned; so that at some points the Coal Measures are brought into contact with the pre-Cambrian syenite.

In the annexed table Mr. Robb has given the equivalency of the more important coal seams in the productive measures throughout the whole region, arranged in the several districts under the names by which they are locally known. The table shows also the aggregate thickness of strata between the coal seams. By placing on the same level the main seam of the Sydney mines and its equivalents throughout the field, all the other seams range approximately on the same horizons, the difference not being greater than we find in many instances where the identity of the beds is indisputable. Mr. Robb has also estimated that the total quantity of coal which this field is capable of yielding, exclusive of any that may be obtained from seams of a less thickness than four feet, is probably not less than one thousand million tons.

Other Minerals of Economic Value.

In addition to the large deposits of coal, above referred to, other useful minerals occur in this district, some of which have been to a small extent quarried or mined. Among the most important are hæmatite, copper ore, limestone, dolomite, marble, building stone, gypsum, fire-clay, syenite, granite and porphyry.

Clay Ironstone.—Numerous beds occur in the Coal Measures containing argillaceous iron ore, both in nodules and in thin continuous bands. An average sample, analysed by Dr. Harrington, yielded about 28 per cent of metallic iron.* A great proportion of the iron made in Great Britain is derived from such ores, but there is not much hope of an adequate supply in Cape Breton for economic purposes; though considerable quantities of it are found strewn along the beach under the cliffs, from which it has been derived.

Hæmatite.—The universal occurrence of calcspar and hæmatite among the rocks of every one of the formations is remarkable. To the latter all the red rocks owe their colour, and in places it separates into veins and stringers. At or near the contact of the Lower Carboniferous with the underlying metamorphic rocks, veins or beds of workable size and quality have been discovered and afford promise of being available for the manufacture of iron. Of this character are the deposits at Boisdale, Barachois and French Vale. A hæmatite ore, with over 30 per cent of metallic iron in places, occurs near Sydney at the contact of the Millstone Grit and Carboniferous Limestone.* Attempts made to work it failed owing to irregularity in quality and in distribution among the red marl, for it passes into siliceous sandstone.

Bog Iron Ore.—Deposits of this ore of excellent quality, but limited extent, have been observed at Schooner Pond, Boisdale and elsewhere within the district.

Copper Ore.—The felspathic rocks of the Coxheath, Boisdale and St. Anns hills contain traces of yellow and purple copper-pyrites and two of these deposits at the Coxheath mine and at George River have been somewhat largely developed.

Limestone.—The limestones which prevail in the Carboniferous Limestone series produce, when calcined, a good strong lime, but rather dark for the interior finishing of houses. An unlimited supply can be produced at a very cheap rate, as beds of

* Report of Progress, 1873-74, p. 242.
* Reports of Progress, 1873-74, 176; 1874-75, p. 170.

considerable thickness, which are marked on the maps, crop out in immediate proximity to good harbours. Kilns have long been in operation at the North-west Arm of Sydney Harbour, for local supply, and from George River a large amount of lime has been exported. In connection with the erection of furnaces for the manufacture of iron and steel at Sydney, some of these beds have been found available for employment as a flux.

Dolomite.—A bed of white, massive, coarsely crystalline dolomite, 144 feet in thickness, of the George River Limestone series, has been quarried by the Messrs. Burchell at New Campbellton, about ten thousand tons exported, and used as a flux in the manufacture of steel. It is suitable also for the production of pulp in paper making. Its analysis as given by Dr. Hoffmann is as follows :—*

Carbonate of lime	53·018
" magnesia	43·583
" iron	·506
" manganese	·266
Sulphate of lime	1·771
Chlorine	·036
Water { hygroscopic	·272
Water { combined	·071
Insoluble residue	1·553
	101·076

Marble.—In the same series, white and variously tinted marbles can also be procured with great facility at George River, French Vale and New Campbellton. At George River, they have been quarried to a small extent.

Building Stone.—The sandstone, both of the Millstone Grit and Coal Measures, are generally too coarse, too irregular in the bedding and too much impregnated with iron to yield good building materials, except for foundations and other rough work. Some of the upper beds of the Carboniferous Limestone series, however, afford a dark-red, brown or chocolate-coloured, very homogeneous sandstone. which would probably be more valuable as a building material. Such beds crop out at the water's edge in Sydney Harbour, in the most advantageous position for working and shipping.

Flags.—Some of the beds in the Millstone Grit and calcareous sandstone in the productive measures produce excellent flags, which have been quarried to a limited extent for local use.

Grindstones of fair quality are manufactured to a limited extent for local use from the sandstones of the Coal Measures.

Gypsum.—The Carboniferous Limestone series in Cape Breton is specially characterized by the occurrence of extensive deposits of

* Reports of Progress, 1873-74, p. 174; 1874-75, p. 253.

gypsum; but in the district to which reference is here particularly made, no deposits of this mineral of economic importance have been discovered. At North Sydney, Boularderie Island and Cape Dauphin, gypsum beds of limited extent have been noted.

Brick-clay and Fire-clay.—These materials are also available in the district; the former having been worked at Sydney, North-west Arm and other points; while the latter may be obtained from the under-clays of most of the coal-seams.

An altered felsite, analysed by Dr. Hoffmann* and found suitable for the manufacture of fire-bricks and pottery, has been seen at several places in the Coxheath Hills as recorded on the map.

Celestite.—This mineral, which is one of the sources of the strontium nitrate used in the production of red fire in pyrotechny, is found on the right bank of Sydney River, about a mile and a half above Sydney Bridge, where a bluish-gray bed, about a foot in thickness, containing specks of galena, may be seen for a considerable distance along the river, overlaid by gray slaty limestone.

Asbestus.—A variety of this mineral, apparently of no industrial value, is found near the copper mine among pre-Cambrian rocks at George River.

Syenite, *Granite* and *Porphyry*, differing widely in texture and composition, of fine varieties of colour, susceptible of a high polish and fit for decorative work, occur abundantly in the Coxheath, Boisdale and St. Anns hills and are worthy the attention of capitalists.

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* Report of Prngress, 1874-75, pp. 423-426.

TABLE showing the Equivalency of the principal Coal Seams in the Sydney

NAMES OF THE DISTRIC

NAMES OF THE COAL SEAMS.	COW BAY.				GLACE BAY.				LINGAN TI		
	North Side. Section VIII.*	Strata and Coal.	South Side. Section IX.	Strata and Coal.	East Side. Section XI.	Strata and Coal.	Bridgeport. Section XII.	Strata and Coal.	Lingan Side. Section XIV.	Strata and Coal.	S
		Ft. in.		Ft. in.		Ft. in.		Ft. in.		Ft. in.	
									Seam A	3 0	
										306 2	
									Carr Seams	6 5	Pa
										190 1	
					Hub	9 10	Hub	9 5	Barachois	12 1	Cra
						366 3		344 4		379 3	
	Block House	9 2	Block House	9 2	Harbour	5 3	Harbour	6 1	David Head	8 0	Vi
		319 1		285 8		299 3		238 7		235 0	
	Seam D	1 0	Seam D	1 0	Bouthillier	2 0	Bouthillier	4 0	Seam D.	3 0	Wi
		130 6		107 0		74 2		92 1		78 1	
	Seam E	3 2	Seam E	2 6	Back Pit	4 9	Back Pit	4 0	North Head	4 0	Nu
		118 0		160 7		112 9		83 3		75 11	
	McAulay	7 9	McAulay	4 11	Phelan	8 3	Phelan	8 7	Lingan Main	8 0	H.
		215 10		187 9		188 3		108 1		95 3	
	Spencer ?	5 0	Spencer (South Head.)	3 9	Ross	5 6	Emery	1 8	Seam G	2 6	D.
		338 6		330 11		307 7		279 2		340 5	
	Long Beach	1 4	Long Beach	3 1	Lorway	4 0	Gardiner	5 9	Seam H.	1 0	Sea
Total thickness of coal in seams which may be workable		27 5		23 5		39 6		39 6		47 0	

* The Roman numerals above the sections denote their numbers in the Report of Progress for 1874–75.

Seams in the Sydney Coal Field, with the intervals between each in the several Sections.

F THE DISTRICTS AND BASINS.

LINGAN TRACT.				SYDNEY MINES.				BOULARDERIE.		CAPE DAUPHIN.	
N SIDE.	Strata and Coal.	SYDNEY HARBOUR.	Strata and Coal.	SYDNEY HARBOUR.	Strata and Coal.	L. BRAS D'OR.	Strata and Coal.	WEST SIDE.	Strata and Coal.	MIDDLE.	Strata and Coal.
n XIV.		Section XV.		Section XVI.		Section XVII.		Section XVIII.		Section XXI.	
	Ft. in.		Ft. in.		Ft. in.		Ft. in.		Ft. in.		Ft. in.
.....	3 0			Cranberry Head.....	3 8			Point Aconi.....	3 2		
	306 2				281 4				242 0		
ns	6 5	Paint.....	13 4	Lloyd Cove.....	6 4	Lloyd Cove.....	8 1	Bonar.....	6 10		
	190 1		176 3		269 1		231 7		218 9		
.....	12 1	Crandall, &c.....	7 11	Chapel Point.....	3 9	Seam B..	4 2	Stubbart.....	7 6		
	379 3		320 3		322 9		380 7		413 3		
ad.....	8 0	Victoria	6 7	Sydney Main.....	6 0	Sydney Main.....	3 0	Seam C.....	2 9		
	235 0		308 8		315 10		205 0		219 4		
.....	3 0	Willie Fraser.....	3 6	Willie Frazer.....	1 4	Bryant	2 0	Millpond.....	3 11	Seam D.....	1 8
	78 1		83 11		117 0		78 0		176 5		237 0
ad.....	4 0	Number Three.....	4 0	Indian Cove..	4 8	Edwards..	5 5	Blackrock.....	3 0	Four-feet..	4 0
	75 11		116 4		87 0	(approx.).....	100 0		125 8		53 3
ain.....	8 0	H. McGilvary.....	6 3	Seam F.....	1 7	Seam F.....	2 9	Seam F.....	0 8	Seam F.....	1 9
	95 3		126 6		123 9	(approx.).....	160 0		43 9		54 0
.....	2 6	D. McGilvary	2 2	Stony.....	3 0	Collins	5 0	Seam G.....	0 11	Six-feet.....	6 0
	340 5		362 9								
.. ..	1 0	Seam H.....	0 10								
.....	47 0	.....	44 6	.....	30 4	.....	30 5	.....	28 9	.....	13 5

[Face page 16.]